CHAPTER II.

PRODUCTION.

Chapter II. Production.

Minerals.

Diamonds.

In the latter part of the sixteenth century (1585), two English travellers Fitch and Newberry mentioned Belgaum as a great diamond market.[1] The Belgaum diamonds probably came from the Golkondah and other mines in the Nizám's territories. Still, it is worthy of note that part of the sandstone towards the Kolhápur side of the district is the same old diamond sandstone which is found at Kadapah in Madras and at other diamond fields.[2]

Gold.

The geological conditions necessary for the development of gold are present in much of the Belgaum rock. In 1852, an examination showed that gold occurs in much of the coarse-grained gravel or local drift, so abundant on the sides of hills in many parts of the district. Gold was also found in the valley of the Malprabha near Chikop, about twenty-five miles east of Belgaum. The first basin of Chikop gravel yielded two minute grains of fine gold with much worn corners. After the gravel was washed, there remained a black iron sand with yellow grains of gold standing out clearly from the dark ground. The result of this and of other trials was to show that every basin of gravel contained one or two minute grains or scales of gold. Under black soil, on the left bank of the right branch of the stream, which passes by the village of Markumbi two miles west of Chikop, was gravel and marl, and below the marl was conglomerate limestone resting on disturbed and hardened chlorite slate. The gravel in the bed of the stream contained gold. And gold was also found at Belevádi on the south side of the Malprabha, where the stream flows in a hollow between two parallel ridges of metamorphic rock. In the whole gold-yielding area very few quartz veins occur, and none are found with a north and south course.

In this part of the country were professional gold-washers, some of them settled and others wanderers. The settled gold-washers used a trough about four feet long nine inches high and one foot broad. In washing the gravel this trough was propped on sloping stones on the bank of the stream. One man threw in a basketful of gravel and another stirred the gravel with his hand and poured on water.[3] The larger gravel was thrown out and the sand was again washed in a round shallow dish about eighteen inches across and four inches deep. The gold dust was amalgamated with mercury and the mercury sublimed on charcoal.[4] The greatest proportion of gold, though the amount was small, was found in a small stream to the west of Belevádi.

Iron.

Iron,[5] nearly equal to Swedish iron, was formerly made

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[1] Hakluyt's Voyages, II. 385.
[2] Bom. Gov. Sel. VIII. 6.
[3] Trans. Bom. Geo. Soc. XI. 2-6.
[4] Mem. Geo. Surv. XII. 259.
[5] This and the remaining mineral sections are from materials supplied by Mr. G. V. Gáyatonde, Assistant Engineer.

Minerals.

Iron.

near Kánur, Punare, and Pátne in Belgaum; at Kaitnal and Távaj in Gokák; at Kitur in Sampgaon; and near the Rám pass.[1] The ore is generally peroxide of iron with a mixture of clay, quartz, and lime. All the laterite of the district is charged with iron though in too small a proportion to make it worth smelting. In smelting iron the practice was to gather small nodules with iron ore and crush them to powder with iron hammers. The powdered ore was then mixed with charcoal and put into a round upright furnace which was kept at an intense heat by air blown continuously by hand-bellows. No flux was used as the ore contained all that was wanted. As it smelted, the liquid metal flowed into a round hole at the bottom of the furnace. When all the metal had run into the hole the mass of iron was dragged out by a pair of large pincers, placed on an anvil, and beaten by hammers. The metal contained a great deal of foreign matter which was removed by heating it in a common smith's furnace, and, while red hot, by beating it with quick blows of five or six heavy hammers worked by men grouped round the anvil. The hammering was continued till the metal was considered pure. This iron was of first class quality. The chief difficulty in the way of iron-smelting was the large quantity of charcoal it consumed. Brown hæmatite, which forms the matrix in a hornstone-breccia at Basargi, is smelted at Tegihál, both the villages lying on the left bank of the Malprabha, between Manoli and Torgal. The manufacture of iron has now ceased, partly on account of the increased price of fuel and partly because of the fall in the price of iron. Besides iron the only metallic ore which occurs in any quantity is an earthy powdery form of binoxide of manganese which is found among weathered dolomite at Bhimgad.[2]

Stones

There are stone quarries at Pátne, Halkarni, Chándgad, Dukurvádi, and Dolgarvádi in Belgaum; at Chikodi and Nipáni in Chikodi; and at Kágvád, Ainápur, Shedbál, Kakmari, and Athni in Athni.[3] The stones are green basalt or trap, gneiss, quartzose sandstone, gray sandstone, reddish gray sandstone, and laterite. Green basalt or trap is found in most parts of the district in hills, in boulders, and in river-beds. With some exceptions it is hard and lasting. It has been used in several bridges and large buildings. The fort of Belgaum is partly of this stone brought from a village named Kanbargi, three miles north-east of Belgaum, and partly of sandstone from hills nine or ten miles to the north. The stone has worn well as the fort is now 400 years old and the masonry is still fresh.

Gneiss is found in the Khánápur sub-division. It is used for rough work and for road-metal, but on account of its hardness it is not

[1] In 1822, at Nersa, about six miles west of Khánápur, iron was worked by a wandering tribe who came yearly in the fair season from Goa or the Sávantvádi state. Mr. Marshall found common clayey ironstone exposed in abundance about the hills, but it did not yield much metal. The villagers were wholly unacquainted with the nature of the process by which the metal had been extracted. Marshall's Statistical Reports, 98. [2] Memoirs Geological Survey, XII. 250, 263.

[3] The forts of Kálánadigad, Vallabhgad, Páijargudd, and the temple at Chándgad Kankumbi are built of laterite or iron clay, which, except as road-metal, is now little used. Memoirs Geological Survey, XII. 268.

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generally used in cut-stone work. Quartzose sandstone is found near Sutgati in the valley of the Ghatprabha at Gokák and at Saundatti. It is gray in colour, very hard, gritty, porous, and lasting, and is used where great strength is required as in the arch stones of bridges. At Gokák and Saundatti it is made into millstones from one to three feet in diameter. Gray and reddish-gray sandstone is found in Parasgad. Though very soft and absorbent, it may be used in inferior kinds of work instead of brick. The hones that used to be quarried in a bed of very hard clay schist at Kákti north of Belgaum are not now in demand. Laterite of varying quality is found in the west near the Sahyádri range. Near Belgaum is a claystone enriched with iron in the form of red and yellow ochres, with a perforated and cellular structure. The heavier claystone with more iron is generally harder and more lasting than the claystone with less iron. Near where it occurs this stone has been used for many buildings and a few bridges. The cost of laterite bricks varies from 10*s.* to 12*s.* (Rs. 5-6) the hundred cubic feet. It is quarried in rectangular blocks. Magnesian limestones or dolomites occur in the gneissic series on the slopes of the Sahyádris east of Goa. The beds exposed in Bhimgad hill are unfit for polishing, as numerous thin folia of granular quartz permeate the rock.

In making and repairing roads three kinds of metal are used, trap, quartzose sandstone, and laterite. The price of trap and quartzose sandstone varies from 10*s.* to 11*s.* (Rs. 5 - 5½), and of laterite from 3*s.* to 6*s.* (Rs. 1½ - 3) the hundred cubic feet. For fair weather and cross country roads hard red gravel is used which costs about 2*s.* (Re. 1) the hundred cubic feet. Good sand or gravel is found in the beds of most streams and rivers. The rates vary from 3*s.* to 8*s.* (Rs. 1½ - 4) the hundred cubic feet. The metallic sand which is used instead of blotting paper is found in several rivers at places where they pass through black soil. The best is the Krishna sand. A very good white clay for earthenware, which burns gray and hard, is found near Khánápur.

Lime.

The lime in general use is made from calcined nodules or *kankar* of limestone which are found on the surface in detached patches throughout the district, and at some places in quarries. The lime nodules contain a mixture of sand and clay, and so do not want much sand or *surki*, to make good hydraulic mortar. Calcined lime costs £3 16*s.* to £4 (Rs. 38 - 40) the hundred cubic feet. At Yádvád in Gokák a bed of bluish-gray limestone is quarried for lime. These stones, when calcined, yield lime which is too pure or fat but makes good mortar when freely mixed with sand. This is the best lime for whitewashing. Crystalline limestone is also found in south Khánápur.

Bricks and Tiles.

Good brick-earth is found in several places, the best at Kákti, Yamkanmardi, Sankeshvar, and Nipáni in Chikodi. Burnt bricks measuring 10″ × 4″ × 3″ cost 17*s.* 9*d.* (Rs. 8⅞) the thousand; half round tiles 16″ × 6″ cost £1 1*s.* 6*d.* (Rs. 10¾) the thousand; and ridge tiles cost 6*s.* (Rs. 3) the hundred.

Forests.

In 1863 Dr. Gibson described the forest towards the Sahyádris as all inferior or jungle timber, but much of it of superior quality. In

the thirteen previous years the forest had suffered greatly by fires and from other causes. Teak and blackwood forest began about six miles east of the Sahyádris and stretched through Ghotgali and Kakkeri. The teak had formerly stretched to Dhárwár. Deep woody valleys under the hill of Sidh on the North Kánara border, about five miles south of Ghatgalli, had suffered much from the spread of tillage. Of young growing teak there was still a respectable quantity in the west of the forest abutting on Sidh hill. Further east the trees, though numerous, were stunted and would probably never yield more than rafters and small posts. One kind of timber, which was of great account for building and occurred both on Sidh hill and in the neighbouring forests, was the *hasan* or *hone* Pterocarpus marsupium, a beautiful tree of easy growth. The only forest to the north of Belgaum was in Páchápur. It contained *ain* Terminalia glabra, satin wood or *halda* Chloroxylon swietenia, *nirmali* Strychnos potatorum, and other trees too stunted to be of use except for firewood and tent pegs. A *bábhul* preserve was also set apart in Athni.[1]

Besides[2] a few square miles of private forest the present (1883) area of Government forest is 819 square miles. Of these 688 square miles, chiefly in Khánápur, have, under the Forest Act VII. of 1878, been declared reserved, and 131 square miles protected.[3] The forest is very unevenly distributed, the large sub-divisions of Athni and Parasgad having till lately little or no forest, while Khánápur has twice as much forest as tillage.

The Belgaum forests[4] may be roughly divided into moist and dry, the dry lying east of the Poona-Dhárwár road and including the forests of Chikodi, Sampgaon, and Gokák; and the moist lying west of the Poona-Dhárwár road, including the forests of Belgaum and Khánápur. The Poona-Dhárwár road runs nearly north and south, skirting the Sahyádri range and its outliers from Nipáni to Belgaum, and then bending slightly east into the more level country. In the moist forest the rainfall is heavy, varying from fifty inches to an unknown quantity, probably not less than 200 inches. About one-half of the moist area belongs to the Sahyádris, a mass of laterite-covered mountains, cut by deep densely wooded ravines and open to the full force of the south-west monsoon. Except an occasional patch of rice or *rági* the forest is unbroken. Here the population is scanty and the area fit for plough cultivation

[1] Handbook to the Forests of the Bombay Presidency, 74.

[2] The sections on Forests, Animals, and Birds are from materials supplied by Mr. J. L. Laird-Macgregor, District Forest Officer.

[3] The sub-divisional forest details are :

Belgaum Forests, 1883.

Sub-Division.	Square Miles.		Sub-Division.	Square Miles.	
	Reserved.	Protected.		Reserved.	Protected.
Belgaum ...	150	62	Chikodi ...	36	18
Khánápur ...	308	...	Athni ...	2	...
Gokák ...	101	51	Parasgad ...	65	...
Sámpgaon ...	26	...			
				688	131

[4] Mr. W. H. Horsley, C.S.

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is small. In those villages which lie actually along the crest of the Sahyádris these conditions are most marked. The area culturable with the plough is insufficient even for the small population, and from time immemorial they have chiefly lived on the proceeds of what is known as *kumri* or wood-ash tillage. The steep slopes of the Sahyádris are suitable for this form of cultivation. The dense coppice growing on such slopes is cut down, allowed to dry, and then burnt. The ashes are hoed into the soil and *náchni* or *rági* Eleusine coraçana is sown. If the patch chosen has had its due period of fallow, a very abundant crop results. During the second season a crop of *sáva* Panicum miliare is grown on the same ground. The field is then relinquished and requires a long period of fallow. If left alone for about twenty years it will be found to be again densely covered with coppice. In fact the practice of *kumri* under proper conditions is eminently favourable to the growth of dense coppice. At the introduction of the revenue survey nearly thirty years ago an attempt was made to put a stop to *kumri* under the impression that it must result in denudation. The consequent distress became so marked that in 1875 further allotments were granted in Khánápur and in 1879 similar arrangements were made in Belgaum. These arrangements were inadequate as they did not allow a sufficiently long period of fallow. It has lately been suggested by the Conservator of Forests, Southern Division, that *kumri* allotments should be granted on condition that the people plant with useful trees an area equal to one-third of the area held for *kumri* cultivation. This suggestion has been approved by Government and arrangements are in progress for carrying it out.

The commonest trees are the *jámbul* Eugenia jambolana, *kum* Careya arborea, *máti* Terminalia tomentosa, *harda* T. chebu *hela* T. bellerica, *páiri* Ficus cordifolia, *kel* Ficus infectoria, *umar* F. glomerata, *kindali* Terminalia paniculata, *báva* Cassia fistula, *karanj* Pongamia glabra, *anjan* Memecylon edule, *nána* Lagerstræmia lanceolata, *ávla* Phyllanthus emblica, small bamboo, and *kárvi* Strobilanthus grahamianus. There is a sprinkling of *jámba* Xylia dolabriformis, *sisva* Dalbergia latifolia, *shemba* Acacia concinna, and other acacias, *hasan* Pterocarpus marsupium, *ápta* Bauhinia racemosa, *palas* Butea frondosa, and *pángera* Erythrina indica, but no teak. Of these trees *máti, jámbul, nána, harda, sisva,* and *hasan* are valuable timber trees; *kárvi* and small bamboos are useful only for fencing and roofing; and *kumba* is chiefly used for field tools. *Anjan,* a useful wood, is confined to very moist places on the crest-line of the Sahyádris where it forms unmixed woods of considerable extent. Here and there, dense *ráis* or groves of huge evergreen tree, sometimes covering more than a hundred acres, stand out like dark islands in the grey sea of withered grass and leafless coppice. The commonest trees in these evergreen hill groves are soft woods, *nánás,* jacks, and mangoes with a sprinkling of *mári* palms Phœnix sylvestris, whose sap is drawn for liquor, and of cinnamon trees whose bark is used as a spice. Along the Sahyádris there is comparatively little large timber, though large *mátis, nánás,* and other valuable trees are by no means uncommon in ravines and remote places.

Of minor produce, the *harda* and *hela* furnish myrobalans, the *shemba* supplies the *ritha* or soapnut which is used in cleaning clothes, and the large stretches of bare or thinly wooded slopes furnish grazing for thousands of cattle, which flock to them every year from the grassless eastern plains. As already remarked this western tract is badly wooded. Probably not more than one-twelfth of the whole forest area is stocked with trees. But the moist climate and heavy rainfall cause a free growth wherever there is soil enough for plants to take root. There is little doubt that, when fully guarded from fire, the forest will gradually spread upwards from the lower slopes and watercourses and clothe much that is now bare and useless.

The eastern parts of the moist forest, though not cut off by any natural line of demarcation from the more western parts, may, for convenience, be considered separately. The country is less hilly and is partially sheltered from the south-west monsoon by the crests of the main range of the Sahyádris. The rainfall varies roughly from forty-five to sixty inches, enough to ensure vigorous vegetation. Besides the trees mentioned in the purely Sahyádri forest the timber includes *dhámin* Grewia asiatica, *honangi* Adina cordifolia, *kalam* Stephegyne parvifolia, *siris* Albizzia spp., teak, and large bamboos. The commonest trees are *kumba, jámba, harda,* the dwarf date-palm Phœnix farinifera, *palas, ávla, jámbul,* bamboo, *kindali, máti, nána,* and in the south a good sprinkling of teak and blackwood. The produce is chiefly superior firewood poles from fifteen to thirty feet long, with here and there large standards of *sávari* Bombax malabaricum, *hela, pángera, karambál,* and other soft woods, and less often of *máti, kindali, jámbul,* and other hard woods. The forest increases in heaviness towards the south where are some fifty square miles of good timber, including much clean straight-stemmed teak, *máti,* and blackwood. These tracts are much better wooded than the main range. Probably one-fourth of the forest area is stocked. Teak occurs only in the south and is commonest on the granite hills south of Nandgad. It is generally mixed with *jámba* and bamboo. But between Távarkatti and Bidi there is much pure teak of vigorous growth.

The forests of the dry tract east of the Pooña-Dhárwár road are on the trap and sandstone hills of Chikodi, Gokák, and Sampgaon. They stretch east as far as the town of Gokák, north to Hukeri, south to Deshnur, and west to the moist forest. These dry forests are about the same height (2000 feet above the sea) as the moist forests, but being further inland, the rainfall is much less, probably on an average not more than thirty inches. Cultivation is confined to the valleys and some of the flat-topped trap-hills. The forest-land, about one-eighth of which is stocked with useful wood, is very poor and stony, yielding only firewood scrub with a sprinkling of small poles, fit for hut-building, and of an average height of about ten feet. The produce is chiefly cactus, four or five kinds of fig, *dindal* Anogeissus latifolia, *mashvál* Chloroxylon swietenia, *bandurgi, ávla, gorvi* Ixora parvifolia, *tarvár* Cassia auriculata, *máti* Terminalia tomentosa, *kindali, as* Hardwickia binata, sandal, bamboo, and numberless thorns. Near Nipáni and Degaon there is a little outlying

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forest-land, and near Suldhál and Yamkanmardi teak-scrub also occurs. *Dindal* is perhaps the commonest tree and is useful for firewood but is generally too small for building purposes. *Tarvár* bark is much prized for tanning and *gorvi* bark for making torches. There is also a good deal of small and a little large bamboo. The most widespread shrub is the cactus. Fully half the forest area is covered with cactus. It is rapidly creeping from the cultivated valleys to the tops of the hills, threatening, as has already happened in Mamdápur and other parts of Gokák, to choke all other vegetation. The rapid spread of the cactus appears to be mainly owing to two kinds of thrush, Malacocercus griseus and Argya malcolmi, which live on the fruit and scatter the seeds far and wide. In this part of the Belgaum reserves, the putting down of cactus is the problem of the future. Its eradication is not easy. No ill-treatment short of burning both roots and branches kills it. An attempt is being made to dig it up and burn it, but the result is still doubtful.

The forests of the main Sahyádri range are not at present worked. Most of their valuable firewood and small timber could easily be worked and is sure to improve. Acre for acre, their present value cannot be less than that of the forest tract east of the Poona road, for, though not nearly so regularly stocked, the vigour and quality of the timber make them a far more valuable property. Experiments seem to show that, exclusive of the value of the land, the present net value of the dry forest is not less than £123,634 (Rs. 12,36,340) or £1 4*s.* (Rs. 12) an acre, and that the yearly yield of firewood available without trenching on the capital stock, is about 46,000 cartloads, or 1,150,000 cubic feet, a quantity which more than meets the present firewood demand for the whole district.[1] The eastern part of the Sahyádri forest tract is roughly

[1] This estimate is based on the results of clean cuttings on 439 acres of the Biranholi forest. The details are :

Biranholi Forest Cuttings.

RECEIPTS.

POLES.		BAMBOOS.		FIREWOOD.				ACRE YIELD.								MONEY YIELD.	
				Stems.		Branches.		Poles.		Bamboos.		Firewood.					
												Stems.		Branches.			
Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Number.	Value.	Total.	Acre.
5034	Rs. 926	36,850	Rs. 490	Carts. 7046	Rs. 10,569	Carts. 909	Rs. 909	11	Rs. 2·1	84	Rs. 1·1	Carts. 16	Rs. 24	Carts. 2	Rs. 2	Rs. 12,894	Rs. 29·2

EXPENDITURE.

Cutting and stacking 5034 poles at Re. 1 the hundred	50
Ditto ditto 36,850 bamboos at 4 *annas* the hundred	92
Ditto ditto 7046 cartloads of (stem) firewood at 4 *annas* each	1762
Establishment: two guards at Rs. 7 each, one clerk at Rs. 12 a month, for twelve months	312
Total £221 12*s.* or Rs. 2216	

That is, total receipts of Rs. 12,894 minus Rs. 2216, or Rs. 10,678, and acre receipts of Rs. 29 less Rs. 5 that is Rs. 24. The Biranholi forest is somewhat above the average of the dry forest, but if the average is taken at one-half the above yield, the error is not likely to lie on the side of exaggeration. On the

estimated as equal to the western Sahyádri forests, or 150,000 acres that is about 234 square miles. It supplies the Khánápur store with timber, of which the following statement gives the details for the two years ending 1880:

Sahyádri Timber Sales, 1878-1880.

Timber.	No.	Cubic Feet.	Realized.	Cost.	Net.	The cubic foot.
			£	£	£	s. d.
Teak Logs	1074	26,350	3625	1102	2523	1 10
Blackwood Logs	106	2875	352	121	231	1 7
Miscellaneous Logs ...	303	8712	773	364	409	1 0
Teak Pieces	413	3312	337	56	281	1 8
Blackwood Pieces ...	27	250	18	4	14	1 1
Miscellaneous Pieces ...	56	625	35	10	25	0 9
Teak Poles (superior) ...	11,689	42,862	2103	508	1595	0 9
Do. (inferior) ...	1363	...	71	28	43	0 7
Blackwood Poles... ...	28	162	4	2	2	0 4
Miscellaneous Poles ...	153	550	20	6	14	0 6
Sandal	9	12½	2	$\frac{1}{16}$	$1\frac{5}{16}$	3 0
Total ...	...	85,710½	7340	2201$\frac{1}{16}$	5138$\frac{7}{16}$	...
Yearly Average ...	...	42,855	3670	1101	2569	...

The immediate supply of large timber is nearly exhausted, but fifty or sixty years hence there ought to be no difficulty in securing a constant yield fully equal to the above, as length is more sought than girth and as there is a good stock of young growth. In 1882-83, 115,908 bamboos worth £1222 (Rs. 12,220) were cut.

Firewood forests are worked partly on the toll-house or *náka* system, partly by departmental cuttings. *Nákás*, or forest toll-houses, for collecting fees levied on loads cut and gathered by the buyers, are posted at Nandgad, Gokák, Suldhál, Biranholi, Chinchani, Piranvádi, and Kanburgi. The foresters in charge of the three wood-stores also issue permits for collecting revenue in this way. In 1882-83 the receipts for wood so collected amounted to £2411 (Rs. 24,110). The fees are 1*s.* (8 *as.*) for each cartload drawn by two bullocks, 6*d.* (4 *as.*) for each beastload, 1½*d.* (¾ *anna*) for a man's, ¾*d.* (½ *anna*) for a woman's, and ⅜*d.* (¼ *anna*) for a child's headload.

Departmental cuttings were begun in 1879-80. The practice is to fell all trees within certain limits and to stack the wood in heaps 5′ × 4′ × 10′, equal when air-dried to about one cartload or twenty-five cubic feet solid measure. In the 1879-80 auction sales of 6000 stacks, the average stack rate was 3*s.* (Rs. 1½) and the net proceeds of all departmental cuttings came to £1030 (Rs. 10,300). In 1882-83, 17,813 stacks of firewood were sold for £1068 (Rs. 10,680) net. The system of departmental cuttings has so many advantages that it may

basis of half the Biranholi yield, or Rs. 12 an acre, the net value of the 103,028 acres of dry forest reserves in Sampgaon, Gokák, and Chikodi would amount to Rs. 12,36,336. This represents the estimated value of the crop as it now stands, with only about one-eighth of the ground stocked with useful wood; it will increase as the forest land becomes better stocked. Taking the cartload, or stack, of firewood at 25 cubic feet solid measure and the cartload of branches at twenty-three cubic feet, the average acre yield of stems would amount to 200 cubic feet and the yield of the whole forest area would be 20,605,600 cubic feet of stem wood and 2,369,644 cubic feet of branches. Coppice will renew itself in fifteen years or at twenty years at most. Taking the revolution, as it is called, at twenty years, the area yearly available for cutting would be 103,028 by twenty years, or 5153 acres, yielding 46,377 cartloads or 1,140,119 cubic feet of firewood, that is, at five per cent, or twenty years' purchase, a total value, excluding minor produce, of £139,132 (Rs. 13,91,320).

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seem strange that the toll system should be continued.[1] The objection to stopping the tolls is that a number of people who live near the larger towns depend for their daily bread on gathering wood. It is hoped that by degrees they will find some other means of subsistence as the toll system is wasteful and incompatible with good forest management.

The chief minor produce is the myrobalan-nut or *harda*, which is sent in large quantities to Bombay. From Bombay the best find their way to Europe and the rest are kept for Indian use. Up to 1876-77 the right to gather myrobalans in each sub-division was every year publicly sold by the mámlatdárs to the highest bidders. In 1877-78 the Conservator of Forests, Colonel Peyton, determined to try departmental collection. The nuts were gathered at twenty-nine stores dotted over the myrobalan tracts, and sold to merchants.[2] The result was satisfactory; £4587 (Rs. 45,870) were netted, or more than half as much again as the previous season, though the returns for that year had been higher than those of any former season. The revenue has never again been so high as it was in 1877-78. Still the average for the three years since 1877-78 has been £3275 (Rs. 32,750) compared with an average of £1850 (Rs. 18,500) for the eight preceding years. In 1882-83 the net receipts amounted to £2718 (Rs. 27,180). The receipts vary greatly because both the market and the crop are uncertain, and the last two seasons have not been favourable. A full myrobalan crop is estimated at 1000 tons in Khánápur and at 375 tons in Belgaum.

Other minor products are honey, *fungi*, *tarvár* and other bark for tanning, corinda, *hela*, *ávla*, *ritha*, and other fruits, and grass. Of these grass alone brings in (1882) an appreciable net revenue of about £100 (Rs. 1000) a year. Up to 1881 grass was sold by the mámlatdárs at yearly auctions. In 1881-82 the management of the grazing was undertaken by the forest officers. The receipts for the first year came to over £1200 (Rs. 12,000). After deducting twenty-five per cent which are credited as land revenue, there remained nearly three times as much as the largest sum ever obtained under the old system. The increase would have been more than threefold if the number of cattle had not been greatly reduced by disease immediately before the new system came into practice. The rates charged for one year are: for every head of horned cattle 3*d.* (2 *as.*), and for each goat or sheep ¾*d.* (½ *anna*).

During the eighteen years ending 1882-83 forest receipts have risen from £3094 (Rs. 30,940) in 1865-66 to £14,215 (Rs. 1,42,150) in 1882-83, and the average has risen from £2667 in the five years

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[1] The chief advantages are: It admits of organized management and the determination of the sustained yield of the different forest tracts. As the cuttings are confined to a small area, they can be easily watched, easily renewed, and easily guarded from fire and theft. And as the wood is air-dried before it is moved, it is more easily carried. Finally, as no work is carried on in it, the rest of the forest is safer from fire and theft.

[2] In Khánápur there are eleven stores, at Khánápur, Hemádgi, Shitavade, Gunji, Vátre, Shiroli, Ghotgáli, Chápoli, Jámboti, Kankumbi, and Kongle, the whole yielding on an average about 4000 *khandis* of 560 lbs. each; in Belgaum there are sixteen stores, Kátgali, Vághavade, Kinie, Báilur, Hajgoli, Mahálungi, Kitavade, Pátne, Kalasgade, Gulavde, Vághotre, Umgaon, Bhogoli, Chandgad, Sundi, and Chinchani, with a total average yield of about 1500 *khandis* of 560 lbs. each.

ending 1870 to £11,766 in the five years ending 1882. During the same period, from increase of staff and from the introduction of departmental cuttings and myrobalan gatherings, charges have risen from £966 (Rs. 9660) in 1866 to £4361 (Rs. 43,610) in 1882. Profits have risen from an average of £756 in the five years ending 1870 to an average of £6739 in the five years ending 1882. The following statement gives the details :

Belgaum Forest Finances, 1865-66 - 1882-83.

Year.	Receipts.	Charges.	Profit.	Year.	Receipts.	Charges.	Profit.
	£	£	£		£	£	£
1865-66 ...	3094	966	2128	1874-75 ...	7589	4837	2752
1866-67 ...	1079	1194	...	1875-76 ...	8169	4040	4129
1867-68 ...	2529	1164	1365	1876-77 ...	7976	3696	4280
1868-69 ...	4347	939	3408	1877-78 ...	9534	4667	4867
1869-70 ...	2288	408	1880	1878-79 ...	10,778	5739	5039
1870-71 ...	5132	1435	3697	1879-80 ...	11,579	4488	7091
1871-72 ...	6287	2236	4051	1880-81 ...	9587	3602	5935
1872-73 ...	8428	4759	3669	1881-82 ...	12,720	6945	5775
1873-74 ...	9295	2640	6655	1882-83 ...	14,215	4361	9854

These increased profits are due not to larger timber cuttings, for less timber is now cut than was formerly cut. The increase is due to better prices, to a greater demand for bamboos and firewood, and to improved methods of working the myrobalan and firewood forests.

The permanent staff consists of one deputy conservator of forests on £50 (Rs. 500) a month and his personal establishment, one head-clerk on £3 10*s.* (Rs. 35), one vernacular clerk on £2 (Rs. 20), and three messengers on 16*s.* (Rs. 8) each. The rest of the staff is one ranger on £10 (Rs. 100) a month ; five foresters, one on £4 (Rs. 40), two on £3 (Rs. 30) each, and two on £2 (Rs. 20) each ; six sub-foresters, three on £1 4*s.* (Rs. 12) each, and three on £1 (Rs. 10) each ; and twenty-one guards, eight on 16*s.* (Rs. 8) each, and thirteen on 14*s.* (Rs. 7) each, at a yearly cost of £1248 (Rs. 12,480). During the working season which lasts from November to June the permanent staff is strengthened by thirty-six myrobalan and firewood clerks on £1 4*s.* (Rs. 12) a month; one clerk in the deputy conservator's office on £2 (Rs. 20) a month ; nineteen sub-foresters, one on £2 (Rs. 20), three on £1 10*s.* (Rs. 15), and fifteen on £1 (Rs. 10) ; and seventy-one forest-guards, fifteen on 16*s.* (Rs. 8), and fifty-six on 14*s.* (Rs. 7), at a total cost of £825 (Rs. 8250). The deputy conservator has general charge of the Belgaum forests. Under him are three executive officers, rangers, and foresters, one in charge of Khánápur, one of Belgaum and Sampgaon, and one of Chikodi and Gokák, who keep sub-divisional accounts and carry out cuttings, plantings, and other executive work. Under them the sub-foresters patrol sub-ranges, see that each guard is on his beat, and that he does his work properly. The guard patrols his beat, catches thieves, puts out fires, and guards the forest from harm, a heavy task as a guard's beat averages twenty square miles of forest mixed with tillage.

Near Pátne in Belgaum a plantation which was begun in 1879 numbered in 1881, 2393 seedlings from one to three years old. The plants are nearly all myrobalans which grow well and yield valuable fruit. In starting this plantation the land was given for tillage for two or three years, free of rent, the husbandmen

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undertaking to plant the seedlings and guard them from fire for two or three years without charge. The only outlay has been the cost of raising the plants in the nursery. This has hitherto averaged 30*s.* (Rs. 15) an acre, a high rate owing to the difficulty of getting the seeds to sprout. The seed is sown in January, and in June and July, when four to eight inches high, the seedlings are planted twelve feet apart.

Trees.

[1]All forest trees occasionally occur in the open country. Some trees, such as figs, chiefly *pairi* Ficus cordifolia, banian Ficus indica, and *umbar* Ficus glomerata, *báva* Cassia fistula, *ápta* Bauhinia racemosa, *siris* Albizzia spp., *bor* Zizyphus jujuba, *pándre máti* Terminalia arjuna, *karanj* Pongamia glabra, *jámbul* Eugenia jambolana, *nána* Lagerstræmia lanceolata, and *sávri* Bombax malabaricum are found far from forest tracts. Others, such as *kála máti* Terminalia tomentosa, sandal Santalum album, *mashvál* Chloroxylon swietenia, *ávla* Phyllanthus emblica, *dindal* Anogeissus latifolia, and teak are seldom seen far from forests. Many trees are grown for their fruit, timber, or shade. Cultivated trees are most often found in the east of the district. Many trees such as the guava, lime, mango, and tamarind, which require care in the east, grow wild in the damp western forests. The *karanj*, the willow Salix tetrasperma, the *pándre máti*, and the *jámbul*, grow best in moist places generally on river and pond banks and in rice fields. The well-to-do are fond of planting groves or *ráis*, an acre or two in area, generally mango or jack trees.

Field Trees.

The chief field trees are the *pipal* Ficus religiosa, *umbar* Ficus glomerata, *vad* Ficus indica, *pimpri* Ficus wightiana or Urostigma pseudo-tjiela, and *nándruk* Urostigma retusum or Ficus benjamina. These are generally planted along roadsides and near temples. The following ornamental and flowering trees are also planted along roadsides and in gardens: Albizzia procera and Albizzia lebbek, the large *gulmohr* Poinciana regia, and the small *gulmohr* Poinciana pulcherrima, known locally as *sankeshvari*; the silk cotton tree, *simul* or *sávari* Bombax or Salmalia malabaricum, whose wood is used for making Gokák figures; the sandalwood tree, *shriyandh* or *chandan* Santalum album; the Belgaum walnut, *jangli akrot* Aleurites triloba; *saru* Casuarina muricata, and the cypress also called *saru*, Cupressus glauca; the *ápta* Bauhinia racemosa; the *kánchan*, Bauhinia variegata, of two varieties, the B. purpurescens and the B. candida, yielding beautiful purple and yellow and green flowers; the Bengal almond, *badám* Terminalia catappa; the *asoka* Guatteria or Polyalthia longifolia; the *pila chámpha* Michelia champaca; the *nág chámpha* Messua ferrea; and the *son chámpha* Plumeria acuminata, are grown near houses and roadsides. The *nág chámpha* is very rare.

Fruit Trees.

Among fruit trees are the Mango *ámba* Mangifera indica; the Jack *phanas* Artocarpus integrifolia; the Loquat Eriobotrya japonica, which is quite naturalised; the Custard-apple *sitáphal*

[1] The paragraphs on Trees, Plants, Shrubs, Creepers, Grasses, and Exotics have been contributed by Surgeon-Major C. T. Peters, M.B.

Anona squamosa; the Bullock's-heart *rámphal* Anona reticulata; the Cashewnut *káju* Anacardium occidentale; the *jámbul* Eugenia jambolana; the Bael *bilva* Ægle marmelos; the Woodapple *kavit* Feronia elephantum; the Pummalo *popnas* Citrus decumana; the Sweet Lime *mitha nimbu* Citrus limetta; the Citron Citrus medica; the Lime *nimbu* Citrus bergamia; the Orange *nárangi* Citrus aurantium; the *kokam* Garcinia purpurea; the *ávla* or *ámla* Phyllanthus emblica; the *bor* Zizyphus jujuba; the *turan* Zizyphus rugosa; the *guti* Zizyphus xylopyra; the *chinch* Tamarindus indicus; the *agasti* Agati grandiflora, the flowers of which, with wheat salt and chillies, are cooked into a kind of cake, and the pods and leaves are eaten as curries; the Horse Radish Tree *shenga* or *shegva*, Moringa pterygosperma, whose leaf, flower, and pod are eaten as curries, whose bark is used as a poultice, and by Europeans instead of the horse-radish; an inferior kind of peach, Amygdalus persica; the Guava *jám* Psidium pyriferum and P. pomiferum; a superior kind of Pomegranate *ánár* Punica granatum is grown in Báil Hongal; the *papav* or *pápya* Carica papaya, is grown largely as a dessert fruit; *karanda* Carissa carandas, grows wild about the hill sides and hedges; *kamrak*, Averrhoa carambola and A. bilimbi, bear acid fruit; the Fig *anjir* Ficus carica, is found but the fruit is not so good as the Poona fig; the Mulberry *tut* or *shetut* Morus indica, is grown but not to any large extent; there are different kinds of Plantains *kele* Musa paradisiaca, the fruit of which is used as a dessert fruit, and some varieties, along with the pith and blossoms of the different kinds of plantains, are cooked as curries; and the Pineapple *ananás* Bromelia ananasa.[1]

Among other useful plants are the Soapnut *ritha* or *aritha* Sapindus emarginatus, and the Markingnut *bibva* or *bhilávan* Semecarpus anacardium; the frankincense tree, *dhupsálái* Boswellia thurifera, found on Shendur hill in Chikodi; the Givotia rottleriformis, also called *ritha*, whose light wood is used for making Gokák figures; and the Wild Nutmeg *jaji kai* Tyrrhosia horsfieldii, whose scentless fruit is a little larger than the true nutmeg. Among palms are the Wild Sago Palm *bherli mád* Caryota urens, whose pith yields a coarse sago and is cooked as gruel and the trunk is used as water conduits; the Betelnut *phophal* or *supári* Areca catechu, which is rarely grown; the Wild Date *shendi* Phœnix sylvestris, which is common in Khánápur and Belgaum and on the banks of streams in the east; the Cocoa Palm *náriel* Cocos nucifera, which is grown only in the east in the gardens of the rich; and the Brab or Palmyra *tád* Borassus flabelliformis, which is not very common.

Roadside Trees.

Many miles of roadside have been planted with trees and bamboos. The trees chiefly used are the banian, *páiri*, *umbar*, *ápta*, *siris*, *bábul*, mango, tamarind, *nim*, and bamboo. These trees are useful either as timber or for fences. The figs are the hardiest class of tree and grow well on rocky soil where nothing else thrives.

Many exotics have been introduced near the Belgaum cantonment. Some of them, as the Casuarina, India-rubber, and Pithe-

[1] In 1791 the neighbourhood of Chikodi was famed for producing grapes of extraordinary size and flavour. Moor's Narrative, 14.

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colobium dulce, are apparently hardy trees. Others, as the logwood, the Australian Eucalypti or blue gums, and the acacias have been less successful. Coffee has been lately introduced and grows well in evergreen clumps on or near the Sahyádris.

Hedge Plants.

The chief hedge plants are the *adhalsa* Adhatoda vasica, the *nirgundi* Vitex negundo, the *lantana* Lantana indica, the Mexican aloe Agave americana, the Aloe *kuar* Aloe perfoliata, and the *mendi* Lawsonia alba. The Prickly Pear Opuntia dillenii, is used as a hedge-plant about gardens, but harbours rats and snakes; hedges of the Milk Bush *sher* Euphorbia tirucalli, are also common. The *bor* Zizyphus jujuba, the *bábhul* Acacia arabica, and the Physic Nut *erunde* Jatropha curcas, are used for field enclosures, while the quick-growing Indian Coral Tree *pángera* Erythrina indica, and *shevri* Sesbania ægyptica, are used to support the Betel vine *pán* Piper or Chavica betel.

Water and Marsh Plants.

Of water plants there are the Lotus, *kamal*, of three kinds, Nymphœa stellata, N. rubia, and N. pubescens, the Ipomia reptans, growing in ponds and used in some places as a pot-herb, and the *sola* Æschynomene aspera, growing in marshes and used for making wedding garlands and coronets. The roots of some of the Polygonums which are found on the banks of rivulets were used as food during the 1876-77 famine.

Shrubs and Weeds.

Among the Shrubs and Weeds that grow in waste lands and on hill sides are the *vágáti* Capparis roxburghii with large white showy flowers, the Nettle *bichuti* Urtica or Fleurya interrupta, the Thorn-apple *datura* Datura alba and D. fastuosa, the *supti* Tephrosia suberosa growing on rocky hills, the *tarvár* Cassia auriculata and C. tora, the *kanguni* Solanum incerta and S. jacquinii, a diffuse plant armed with prickles bearing yellow berries of the size of a plum, the Mexican Thistle *pila dhotra* Argemone mexicana, the Swallow Wort *mádár* or *rui* Calotropis gigantea, the *tumba* Leucas linifolia, the *agáda* Achyranthes aspera, and different kinds of Coleus grow as weeds in waste ground. The *ghols* Portulaca quadrifida and P. oleracea are found in moist shady places, while the Lepidagathis cristata and *káli musli* or *musli khund* Curculigo brevifolia and C. graminifolia, prefer more rocky grounds.

Creepers.

Of Creepers there are several convolvuluses, among them the Argyreia; some of the Cucurbitaceæ, such as the Citrullus colocynthis *indráyan*, which grows in hedges along with the milk bush; *tendla* Coccinia indica which bears a beautiful red oblong fruit; and the *gulvel* Cocculus cordifolius a twining shrub found among hedges.

Grasses.

The chief Grasses are: spear grass *kántha gavat* which is not used as fodder for horses, *chirkyáche gavat* which looks like a variety of *kántha gavat*, *kánta márvel* or *makunche gavat* Andropogon scandens which grows during the rains and is considered good fodder, *madhádche gavat* or *kátgod mandi*, a kind of Eleusine, is eaten by cattle, *jangli rala* Panicum italicum is eaten by horses and cattle, *kutta phanda* is not good for horses, *sipi* is considered good fodder, *hariyáli* Cynodon dactylon is excellent fodder for horses and sheep but not for cattle, *phanda* is also not good for cattle, *mol munda*